

# CONFERENCE ABSTRACTS

## The 5th International Conference on Electrical Engineering, Control and Robotics (EECR 2019)

With workshop

The 2nd International Conference on Intelligent Control and Computing (ICICC 2019)

January 12-14, 2019

Xihu Hotel of SCUT, Guangzhou, China

Hosts & Sponsors



Published by



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# SCHEDULE OVERVIEW

January <b>12</b> Saturday	10:00-16:00	<b>Registration &amp; Conference Materials Pick-up</b> Staff: Jennifer Law & Tina Wang Venue: Hotel Lobby
January <b>13</b> Sunday	<b>Morning @ Meeting Hall   1<sup>st</sup> Floor</b>	
	9:00-9:05	<b>Welcome Address</b> Prof. May Huang, International Technological University, USA
	9:05-9:45	<b>Keynote Speaker I</b> Prof. Chun-Yi Su, Concordia University, Canada <i>"Robust Control of Underactuated Mechanical Systems"</i>
	9:45-10:25	<b>Keynote Speaker II</b> Prof. Chenguang Yang, South China University of Technology, China <i>"Biomimetic Control Design and Human Skill Transfer for Intelligent Robots"</i>
	10:25-11:05	<b>Coffee Break &amp; Group Photo</b>
	11:05-11:40	<b>Keynote Speaker III</b> Prof. Quang Ha, University of Technology Sydney, Australia <i>"The State-of-the-Art of Robotics and Automation in Military Earthworks"</i>
	11:40-12:10	<b>Plenary Speaker</b> Prof. Alvin Y. Chua, De La Salle University, Philippines <i>"Unmanned Aerial Vehicle Flight Controller Development and Directions"</i>
	12:10-13:30	<b>Lunch Break</b> Venue: Chinese Restaurant Hall   1 <sup>st</sup> Floor
	<b>Afternoon @ Meeting Room II   1<sup>st</sup> Floor</b>	
	13:30-15:30	<b>Session I-Electronics and Electrical Engineering</b>
	15:30-15:50	<b>Coffee Break &amp; Poster Session</b>
	15:50-17:20	<b>Session II-Computer and Information Management</b>
18:00-20:00	<b>Dinner</b> Venue: Chinese Restaurant Hall   1 <sup>st</sup> Floor	
January <b>14</b> Monday	<b>Optional Events</b> •Lab. Visit •One-day Visit in Guangzhou	

# WELCOME ADDRESS

It gives us immense pleasure to invite you to The 5th International Conference on Electrical Engineering, Control and Robotics (EECR 2019) with the workshop The 2nd International Conference on Intelligent Control and Computing (ICICC 2019) during the period January 12-14, 2019 in Xihu Hotel of SCUT, Guangzhou, China. The conference focuses on the trending, highly popular, but exciting and extremely challenging areas of Electrical Engineering, Control and Robotics from our keynote speakers of leading scientists and a variety of authors around the world. The outcome of our deliberations will play a crucial role in progress achieved in these areas.

The conference brings together World Class participants and young researchers looking for opportunities for conversations that cross the traditional discipline boundaries and allows them to resolve multidisciplinary challenging problems that only a venue of this nature can offer. It is the clear intent of the conference to offer excellent mentoring opportunities to participants. Through this amazing event we trust that you will be able to share the state-of-the-art developments and the cutting-edge technologies in these broad areas.

Special thanks are extended to our colleagues in program committee for their thorough review of all the submissions, which is vital to the success of the conference, and also to the members in the organizing committee and the volunteers who had dedicated their time and efforts in planning, promoting, organizing and helping the conference. Last but not least, our special thanks go to invited keynote speakers as well as all the authors for contributing their latest researches to the conference.

This conference program is highlighted by four speakers: Prof. Chun-Yi Su, from Concordia University, Canada, Prof. Chenguang Yang, from South China University of Technology, China, Prof. Quang Ha, from University of Technology Sydney, Australia and Prof. Alvin Y. Chua, from De La Salle University, Philippines.

We hope this success can develop into persistent success annually, in which there are presenters from all corners of the globe and all major countries.

We sincerely hope you have an excellent time during EECR 2019 in picturesque Guangzhou, China.

EECR 2019 Conference Committee  
Guangzhou, China

# **ORGANIZING COMMITTEE**

## **Conference Chairs**

May Huang, International Technological University, USA  
Chun-Yi Su, Concordia University, Canada

## **Program Chairs**

Hailong Pei, South China University of Technology, China  
Jinlong Lin, Peking University, China  
Quang Ha, University of Technology Sydney, Australia  
Alvin Y. Chua, De La Salle University, Philippines  
Xuelin Lei, East China University of Science and Technology, China

## **Local Organizing Chairs**

Shilu Dai, South China University of Technology, China  
Chenguang Yang, South China University of Technology, China

## **Technical Committees**

Gheorghe-Daniel Andreescu, Politehnica University of Timisoara, Romania  
Hasan Çimen, Afyon Kocatepe University, Turkey  
Long Jin, Lanzhou University, China  
Dong Huang, Chinese Academy of Sciences, China  
Samuel P. Kozaitis, Florida Institute of Technology, USA  
Chih-Jer Lin, National Taipei University of Technology, Taiwan  
Thelma D. Palaoag, University of the Cordilleras, Philippines  
Mahir Dursun, Gazi University, Turkey  
Konstantinos Parsopoulos, University of Ioannina, Greece  
Ray-Hwa Wong, Hwa-Hsia University of Technology, Taiwan  
Zahid Halim, Ghulam Ishaq Khan Institute of Engineering Sciences and Technology, Pakistan  
Najmi Ghani Haider, NED University of Engineering and Technology, Pakistan  
Kardi Teknomo, Ateneo de Manila University, Philippines  
Ning Sun, Nankai University, China  
Yongqin Fan, Xi'an University of Posts and Telecommunications, China  
Cheung-Chieh Ku, National Taiwan Ocean University, Taiwan  
Svetlana Vasileva-Boyadzhieva, International College - Dobrich, Bulgaria  
Fadzilah Siraj, Universiti Utara Malaysia, Malaysia  
Sheila Abaya, University of East-Caloocan, Philippines  
B. B. Biswal, National Institute of Technology, India  
Jan Muhammad, BUITEMS, Pakistan  
KWOK Lam For, City University of Hong Kong

Cengiz ÖRENCİK, Beykent University, Turkey

Eric Chen, Uber, USA

Jennifer L. Santos, Centro Escolar University, Philippines

Emese Gincsiné Szádeczky-Kardoss, Budapest University of Technology and Economics, Hungary

Wen-Jyi Hwang, National Taiwan Normal University, Taiwan

Abdel-Hameed Badawy, New Mexico State University, USA

Jukkrit Kluabwang, Rajamangala University of Technology Lanna Tak, Thailand

Simon K. S. Cheung, The Open University of Hong Kong, Hong Kong

Muhammad Murtaza Yousaf, Punjab University, Pakistan

Waqar ul Qounain, Punjab University, Pakistan

Faisal Bukhari, Punjab University, Pakistan

# LOCAL INFORMATION

## Weather in January

Average daily minimum temperature

10°C

Average daily highest temperature

18°C

## Xihu Hotel of SCUT

广州华南理工大学西湖苑宾馆

Address: No.381, Wushan Road, Tianhe District, Guangzhou, China

广州天河区五山路华南理工大学内西湖畔

Tel: 020—38673008

E-mail: xihuhotel@163.com

Xihu Hotel is a wholly-owned enterprise of South China University of Technology. It was approved by the Guangzhou Tourism Administration in November 2003 and was awarded as the “three-star foreign tourist hotel”. The hotel is located on the beautiful West Lake within the South China University of Technology, a famous university of higher learning. The green trees and flowers bloom in all seasons. It is adjacent to the Guangzhou Commercial Center and South China Expressway, Guangyuan Expressway, 15 minutes from Pazhou Complex and 15 minutes away from the train. 15 minutes from the station, 10 minutes from the East Railway Station, 40 minutes from the South Railway Station and 40 minutes from the airport. With unique geographical advantages, there is the Metro Line 3 (Wushan Station) directly to the east gate of the campus.

宾馆座落在全国著名高等学府华南理工大学校内美丽的西湖畔，湖光山色交相辉映，绿树繁花四季香飘，毗邻广州商业中心及华南快速公路、广园快速公路、距琶洲会展中心 15 分钟、距火车站 15 分钟、距火车东站约 10 分钟、距南站 40 分钟、距机场 40 分钟车程。有着得天独厚的地域优势，有地铁三号线（五山站）直达校园东门。

# INSTRUCTION FOR ORAL & POSTER PRESENTATIONS

## Oral Presentations

- **Timing:** a maximum of 15 minutes in total, including 3 minutes for Q&A. Please make sure your presentation is well timed. Please keep in mind that the program is full and that the speaker after you would like their allocated time available to them.
- All oral session rooms are equipped with data projectors with a standard VGA connector. The speakers could also bring and use their own laptops or other presentation devices. Please check the compatibility of your laptop and the project before the session starts.
- It is suggested that you email a copy of your presentation to your personal inbox as a backup in case for some reason the files can't be accessed from your flash drive.
- In the break before your presentation, please go to the scheduled room to meet the session chair to confirm the title and presenter information of your paper, and copy the slide file (PPT or PDF) to the laptop.
- Videos: If your Power Point files contain videos please make sure that they are well formatted and connected to the main files.

## Poster Presentations

- Poster size is 60cm x 80cm.
- Posters are required to be condensed and attractive. The characters should be large enough so that they are visible from 1 meter apart.

## Dress Code

- Please wear formal clothes or national characteristics of clothing.



# CONFERENCE CHAIR

PROF. MAY HUANG



International Technological University, USA

Dr. May Huang is professor and chair of the electrical and computer engineering department and meanwhile serves as director of global relations division at International Technological University (ITU). She's a guest professor at School of Software and Microelectronics, Peking University (PKU), Institute of Microelectronics, Tsinghua University, and Beijing University of Post and Telecommunication, China. She established research activities at ITU including a joint research team with members from ITU and PKU. Dr. Huang brings over 20 years of Silicon Valley IC design and software design experience to her work. She was a principal designer and project manager at Virtual Silicon Technology, Hitachi Semiconductor America, VLSI Technology, Inc., etc. She participated as a member of working group and balloter on VITAL, Verilog and Analog Extensions of VHDL toward IEEE standard. Dr. Huang obtained her bachelor's degree from South China University of Technology in electrical engineering. She earned her master's degree from Santa Clara University and doctorate from ITU. Her research interests are IC design and artificial intelligence.

# KEYNOTE SPEECHES

PROF. CHUN-YI SU

Concordia University, Canada

## ***Presentation: Robust Control of Underactuated Mechanical Systems***

In recent years, there has been great theoretical and practical interest in controlling underactuated mechanical systems. These systems are defined as underactuated because they have more joints than control actuators. Much of this interest is a consequence of the importance of such systems in application. For example, underactuation may arise in free-flying space robots, underwater vehicles without base actuators, legged robots with passive joints, redundant robots with flexible components, and in many other practical applications. Furthermore, when one or more joints of a standard manipulator fail, it becomes an underactuated mechanism and needs a special control algorithm to continue operation; thus the development of a control technique for underactuated systems will increase the reliability and fault-tolerance of current and future robots. Interest in studying underactuated mechanical systems is also motivated by their role as a class of strongly nonlinear systems where complex internal dynamics, nonholonomic behavior, and lack of feedback linearizability are often exhibited. Traditional nonlinear control methods are insufficient in these cases and new approaches must be developed. In this presentation, an entirely new method is discussed. A robust nonlinear control law is proposed for underactuated mechanical systems in the presence of parameter uncertainties. The development is based on variable structure theory. The main advantage of the presented scheme is that the uncertainty bounds, needed to design the control law and to prove globally asymptotic stability, depend only on the upper bounds of the inertia parameters. These upper bounds can easily be computed making a control law possible for complex underactuated systems. Finally, the real-time application of this algorithm to a specific underactuated robot, Pendubot, is included to demonstrate the control performance.



Dr. Chun-Yi Su received his Ph.D. degrees in control engineering from South China University of Technology in 1990. After a seven-year stint at the University of Victoria, he joined the Concordia University in 1998, where he is currently a Professor of Mechanical and Industrial Engineering and holds the Concordia Research Chair in Control. He has also held several short-time visiting positions including a Chang Jiang Chair Professorship by China's Ministry of Education and JSPS Invitation Fellowship from Japan, and Qian Ren Talents Professor from China. His research covers control theory and its

applications to various mechanical systems, with a focus on control of systems involving hysteresis nonlinearities. He is the author or co-author of over 400 publications, which have appeared in journals, as book chapters and in conference proceedings. In addition to his

academic activities, he has worked extensively with industrial organizations on various projects. Dr. Su has been an Associate Editor of IEEE Transactions on Automatic Control, IEEE Transactions on Control Systems Technology, Mechatronics, Control Engineering Practice, and several other journals. He has served as Chair/Co-Chair for numerous international conferences

## PROF. CHENGUANG YANG

South China University of Technology, China

### ***Presentation: Biomimetic Control Design and Human Skill Transfer for Intelligent Robots***

In the near future, robots are expected to co-habit with our human beings and work closely with us in various fields and even our daily lives. Unfortunately, most of the current robot control technologies are designed for conventional industrial robots which operate behind safeguarding and for predefined tasks, and thus are not able to cope with the varying tasks in unknown dynamic environments. I have therefore developed human-like adaptive control techniques as well as highly effective human robot skill transfer techniques. My work follows the "from human and for human" principle, i.e., study human motor control skills, in order to develop better robot controllers to support human collaborators. My design not only enable versatile and dexterous robot manipulation but also make robot providing personalized assistance to human factors. My investigations not only create a new cross-disciplinary application area where physiologists are able to employ their knowledge and experiences together with roboticists, but will also have a huge impact on the robotics community, through in-depth investigations on the relation between humans and robots.



Dr Yang received Ph.D. degree in control engineering from the National University of Singapore, Singapore, in 2010. He received postdoctoral training at Imperial College London, UK and was recipient of the EU Marie Curie International Incoming Fellowship as a named individual. He is a Senior Member of IEEE and a Fellow of Higher Education Academy (HEA). He has made significant contribution to the research on robot control and human robot interaction, as evidenced by 2011 King-Sun Fu Best Paper Award of the IEEE Transactions on Robotics, 2014 World Congress on Intelligent Control and Automation (WCICA) Steve

and Rosalind Hsia Best Biomedical Paper Award, 2015 IEEE International Conference on Information and Automation (ICIA) Best Conference Paper Award, 2015 International Conference on Intelligent Robotics and Applications (ICIRA) Best Conference Paper Award, 2016 International Conference on Human System Interaction (HSI) Best Conference Paper Award, 2017 International Conference on Modeling, Identification and Control (ICMIC) Best Theory Paper Award, 2017 IEEE International Conference on Advanced Robotics and Mechatronics (IEEE ARM) Toshio Fukuda Best Mechatronics Paper Award, and a number of Best Student Paper awards received by his students.

PROF. QUANG HA

University of Technology Sydney, Australia

***Presentation: The State-of-the-Art of Robotics and Automation in Military Earthworks***

The advancement in Robotic and Autonomous Systems (RAS) has brought about a new horizon in construction and infrastructure. There is evidence of the increasing interest in RAS technologies in the civil construction sector being reflected in earthworks for the military applications. In particular, Army or ground-based forces are frequently called upon to conduct earthmoving tasks as part of military operations, tasks which could be partially or fully aided by the employment of RAS technologies. Along with recent advances in the Internet of Things and cyber-physical systems, it is essential to examine the current maturity, technical feasibility, and affordability, as well as the challenges and future directions of the adoption and application of RAS to military earthworks based on such platforms as excavators, bulldozers, loaders, graders and dump trucks. This keynote presents a comprehensive review and provides a contemporary and industry-independent analysis on the state-of-the-art of platform-centric earthmoving automation used in defence, spanning current world's best practice through to that which is predicted over the coming years.



Quang Ha received the B.E. degree from Ho Chi Minh City University of Technology, Vietnam, in 1983, the Ph.D. degree from Moscow Power Engineering Institute, Russia, in 1993, and the Ph.D. degree from the University of Tasmania, Australia, in 1997, all in electrical engineering. He is currently an Associate Professor with School of Electrical and Data Engineering. His research interests include automation, robotics and control systems. Dr Ha is a Senior Member of the IEEE and on the Board of Directors of the International Association of Automation and Robotics in Construction. He has been a Member of the Editorial

Board of the IEEE Transactions on Automation Science and Engineering (2009-2013), Automation in Construction, Mathematical Problems in Engineering, Elsevier Heliyon, Journal of Industrial Electronics & Applications, and Journal of Advanced Computational Intelligence and Intelligent Informatics. Quang Ha served as Chairman of several international conferences on automation and intelligent systems. He was the recipient of 14 best paper awards from the IEEE, IAARC and Engineers Australia, including the Sir George Julius Medal in 2015.

PROF. ALVIN Y. CHUA

De La Salle University, Philippines

***Presentation: Unmanned Aerial Vehicle Flight Controller Development and Directions***

Unmanned Aerial Vehicles (UAV) are used in different applications like mapping, monitoring, disaster management, etc. In every UAV system, the flight controller plays an integral part in its performance. A comprehensive review of the different flight controllers available in the market will be discussed together with the control software. As the Philippines is moving towards economic development, different sectors are very interested in the UAV area and it is envisioned that the country would be a leader in UAV technology in the future. In order to hasten the development of the UAV technology, the available hardware and software technologies are taken into consideration towards creating a highly flexible system. Finally, the future directions of flight controllers in UAV technology will be explained toward the development of appropriate technologies in unique scenarios.



Dr. Alvin Y. Chua is a Professor and the Chairman of the Mechanical Engineering Department of De La Salle University. He earned his BSME, MSME, and Ph.D. in ME at De La Salle University-Manila. As a scholar under the Department of Science and Technology-Engineering and Science Education Project (DOST-ESEP), he conducted his dissertation research at the University of New South Wales, Australia. He received a special citation for the 2003 NAST-DuPont Talent Search for Young Scientists (Mechanical Engineering). He was also awarded the 2015 Outstanding Student Adviser of the American Society of Mechanical Engineers (ASME). He

has published in several journal publications and international conferences like Conference on Decision and Control (CDC), and Advance Intelligent Mechatronics (AIM).

His current research interests are on Mechatronics, and UAV systems. In his Mechatronics research, he was able to work on researches that improved the intelligence of articulated and mobile robot systems. He was also able to apply Mechatronics to improve the energy generation of renewable energy systems. In his UAV systems research, he dealt with control techniques (e.g. Fuzzy Logic, Kalman Filters) for rotorcrafts (e.g. quadcopter, octocopter) and blimps for improved mobility. Currently, he is working on applying UAV technologies to disaster management and inspection applications. He also received a government grant under DOST-PCIEERD entitled "Development of a Flight Controller for a Modular UAV".